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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/663,021

09/15/2000

Kai Yang

D412

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03/13/2003

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EXAMINER

CLARK, SHEILA V

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 03/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/663,021

Applicant(s)
Yang et al

Examiner
Sheila V. Clark

Art Unit
2815



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE three MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Jan 30, 2003
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- *See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 12 6) ☐ Other:

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The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification on for example page 4 with references to figures 1 and 2 describe channels 101 and 102 as openings. The second channel is described as having an opening 106 with side walls 109. The channel 102 is taught to be filled with conductive material.

With regard to the instant invention shown in figures 3-4 a similar channel or opening is shown as 201 containing a conductive filler material. The conductive filler material in figure 3 looks to be the reduced or etched back as described in line 28 of page 5. The disclosure on page 5 appears to recite that the channel is etched back but if the channel is an opening then the conductive material in the channel is etched back. The specification therefore is confusing regarding an accurate description of the component features of the invention.

The specification on for example page 7 further describes a semiconductor interconnect barrier but teaches use of no semiconductor materials of which said barrier is formed. Therefore It would not appear to be " semiconductor". What makes it " semiconductor"? The disclosure describes it as a metal barrier that may be formed of copper so describing it as semiconductor appears misdescriptive. It would appear to be a metal interconnect barrier.

Claims 19 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claim 10 describes a recessed channel which is confusing because a channel is an opening. The recessed features appears to be the filling in the channel.

A " semiconductor interconnect" appears to have no material basis in the disclosure.

In claim 19, it is unclear what is meant by a recessed channel in the channel opening. The "channel" in the disclosure on for example pages 4 and 5 are described as openings or trenches.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-4 are rejected under 35 U.S.C. 102(a) as being anticipated by Zhao et al.

Zhao et al shows a first barrier layer 28 disposed in a channel opening of a dielectric layer, a conductive layer 29 disposed in said barrier layer in said opening and a second barrier layer 34 disposed over said layers and totally enclosing said conductive layer. The material recited in the claims are further taught by Zhao et al (see col. 8, line 33, col. 4. lines 63-64, col. 10, line 29, col. 8, lines 23).

Claims 7-10, 13-16, are rejected under 35 U.S.C. 102(a) as being anticipated by Zhao et al.

Zhao et al shows a first barrier layer 28 disposed in a dielectric layer lining, a conductive layer 29 disposed in said barrier layer and a second barrier layer 34 disposed over said layers and

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totally enclosing said conductive layer. The material recited in the claims are further taught by Zhao et al (see col. 8, line 33, col. 4, lines 63-64, col. 10, line 29, col. 8, lines 23). The steps of providing, forming, removing and depositing are deemed to be inherently taught by Zhao et al.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5, 6, 11, 12, 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Dubin et al.

The claims from which claims 5, 6, 11, 12, 17, 18 depend have been discussed above except for the first and second barrier layer formed of the same materials and of the same thickness.

As Zhao et al fails to limit the barrier layer material to any one particular material but instead teaches that the barrier material may be chosen from a variety of well known barrier material it is therefore suggested that the material of the first and second barrier layers may be the same if desired.

Further as Zhao et al fails to express a particular thickness of the second barrier layer but refers to a particular application for deposition technique which is related to the Dubin et al patent which teaches forming said layer in the range of thickness as those discussed by Zhao et al with regard to the first barrier layer. Therefore it would have been obvious to one having ordinary skill

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in the art at the time the invention was made to form the second barrier layer of the same thickness as the first. The ordinary artisan would have been motivated to modify Zhao et al because Zhao et al suggests use of the techniques taught by Dubin et al which would include similar layer thickness of the second layer to that of the first.

Claims 19 and 20 in so far as understood are rejected under 35 U.S.C. 102(a) as being anticipated by Zhao et al.

Zhao et al shows a first barrier layer 28 disposed in a channel opening of a dielectric layer, a conductive material 29 disposed in said barrier layer in said opening and an interconnect barrier layer 34 disposed over said layers and totally enclosing said conductive material. Said interconnect layer 15 is shown below the surface of the device and therefore recessed below the surface in the channel.

The claims contain method of making characteristics (i.e. self aligned) given no patentable weight in determining the patentability of the final device structure.

Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao 190 USPQ 15 at 17(footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessman, 180 USPQ 324; In re Avery, 186 USPQ 161 and In re Marosi et al, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in "product by process" claims, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not.

Claims 1-4 are rejected under 35 U.S.C. 102(a) as being anticipated by Besser et al.

Besser et al shows a first barrier layer 11 disposed in a channel opening of a dielectric layer, a conductive layer 12 disposed in said barrier layer in said opening and a second barrier layer 15

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disposed over said layers and totally enclosing said conductive layer. The material recited in the claims are further taught by Besser et al et al.

Claims 19 and 20 in so far as understood are rejected under 35 U.S.C. 102(a) as being anticipated by Besser et al.

Besser et al shows a first barrier layer 11 disposed in a channel opening of a dielectric layer, a conductive material 12 disposed in said barrier layer in said opening and an interconnect barrier layer 15 disposed over said layers and totally enclosing said conductive material. Said interconnect layer 15 is shown below the surface of the device and therefore recessed below the surface in the channel.

The claims contain method of making characteristics (i.e. self aligned) given no patentable weight in determining the patentability of the final device structure.

Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao 190 USPQ 15 at 17(footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessman, 180 USPQ 324; In re Avery, 186 USPQ 161 and In re Marosi et al, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in "product by process" claims, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not.

Claims 1-4 are rejected under 35 U.S.C. 102(a) as being anticipated by Joshi et al.

Joshi et al shows in figure 8, a first barrier layer 28 disposed in a channel opening of a dielectric layer, a conductive layer 16 disposed in said barrier layer in said opening and a second barrier layer 17 disposed over said layers and totally enclosing said conductive layer. The material recited in the claims are further taught by Joshi et al.

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Claims 19 and 20 in so far as understood are rejected under 35 U.S.C. 102(a) as being anticipated by Joshi et al.

Joshi et al shows a first barrier layer 28 disposed in a channel opening of a dielectric layer, a conductive material 16 disposed in said barrier layer in said opening and an interconnect barrier layer 17 disposed over said layers and totally enclosing said conductive material. Said interconnect layer 17 is shown below the surface of the device and therefore recessed below the surface in the channel.

The claims contain method of making characteristics (i.e. self aligned) given no patentable weight in determining the patentability of the final device structure.

Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao 190 USPQ 15 at 17(footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessman, 180 USPQ 324; In re Avery, 186 USPQ 161 and In re Marosi et al, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in "product by process" claims, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not.

Claims 1-20 are rejected.

Tuttle shows structures having second recessed barriers located in a channel region.

Applicant's arguments filed 1-30-2003 have been fully considered but they are not persuasive. The claims continue to fail to recite a second barrier layer "in" the. The second barrier in claim 1 continues to be recited as being disposed over the conductive layer in the channel. The conductive layer in this line is recited as being "in the channel". Therefore "in the channel appears to describe the conductive layer. "In the channel" also is located next to "conductive layer: and thereby is further located next to the component it is describing. The claims should be modified

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to clearly recite that the second barrier is disposed in the channel with the describing information located adjacent to the component to which it is describing. Such as, a second barrier layer in the channel and disposed over said conductive layer. "In the channel" now describes the second barrier.

Also even with the above noted changes the references relied upon in the rejections are deemed to clearly teach the second barrier formed in the channel and the conductive layer being fully encased in metal. This seems to be well taught by the prior art. Applicant is to also note as discussed above that figure 3 of the instant invention appears to show that the conductive layer in channel 201 is recessed which has yet to be recited as such in the claims.

As discussed with the applicant on the interview of December 10th barrier caps formed in trenches of damascene structures are very popular. Applicant is asked to consider incorporating features in the claims that provide novelty over what is already well known

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner S.V. Clark whose telephone number is (703) 308-4924. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee, can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722 or 7724. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956

March 6, 2003


SHEILA V. CLARK
PRIMARY EXAMINER